

CLAIMS

1. A write-once-type recording medium comprising:

a data area in which record data is recorded;

5 a spare area in which the record data to be recorded or already recorded at a position of a defect in said data area is recorded; and

a defect management area in which defect management information including a defect list is recorded, the defect list
10 indicating (i) the position of the defect in said data area and (ii) a position in said spare area at which the record data to be recorded or already recorded at the position of the defect is recorded,

said defect list being divided into a plurality of partial defect lists,

15 index information able to be an index for specifying a partial defect list among the partial defect lists which carries newest information, being appended to at least one of the partial defect lists.

20 2. The write-once-type recording medium according to claim 1, wherein said one of the partial defect lists to which the newest index information is appended is placed at an end of the partial defect lists recorded successively in a row in said defect management area.

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3. The write-once-type recording medium according to claim 1,

wherein

said spare area is divided into a plurality of partial spare areas, and

the size of the partial defect list is at least large enough to
5 record address information with the number corresponding to the
number of blocks of the record data which can be recorded in said
spare area.

4. The write-once-type recording medium according to claim 1,
10 further comprising a control information recording area in which
information for controlling an operation of recording and/or reading
in said data area is recorded,

said defect management area including (i) a temporary defect
management area, which is placed between said control information
15 recording area and said data area and in which the defect
management information is temporarily recorded, and (ii) a definite
defect management area, which is placed in said control information
recording area and in which the defect management information is
definitely recorded.

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5. The write-once-type recording medium according to claim 1,
wherein the defect management information further includes
definition information for specifying positions of said data area and
said spare area.

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6. The write-once-type recording medium according to claim 1,

wherein empty area information for indicating presence or absence of an empty area in said spare area is appended to a partial defect list placed at the end of the partial defect lists recorded successively in a row in said defect management area.

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7. A recording apparatus for recording record data onto a write-once-type recording medium comprising: (I) a data area in which the record data is recorded; (II) a spare area in which the record data to be recorded or already recorded at a position of a defect in said data area is recorded; and (III) a defect management area in which defect management information including a defect list is recorded, the defect list indicating (i) the position of the defect in said data area and (ii) a position in said spare area at which the record data to be recorded or already recorded at the position of the defect is recorded, said defect list being divided into a plurality of partial defect lists,

said recording apparatus comprising:

a first recording device for recording the record data into said data area;

20 a memory device for storing therein the defect management information;

a defect-detecting device for detecting a defect in said data area;

a second recording device for recording the record data to be recorded at the position in said data area of the defect detected by said defect-detecting device, into said spare area;

a list-updating device for updating the partial defect list by recording, onto the partial defect list, information for indicating (i) the position of the defect detected by said defect-detecting device and (ii) the position in said spare area at which the record data to
5 be recorded at the position of the defect is recorded; and

a third recording device for (i) selecting the partial defect list updated by said list-updating device from among the plurality of partial defect lists included in the defect management information stored in said memory device and (ii) recording the selected partial
10 defect list into said defect management area.

8. The recording apparatus according to claim 7, further comprising an index information appending device for appending index information able to be an index for specifying a partial defect
15 list among the partial defect lists which carries newest information, to the partial defect list updated by said list-updating device,

said third recording device recording (i) the partial defect list updated by said list-updating device and (ii) the index information, into said defect management area.
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9. The recording apparatus according to claim 8, further comprising a reading device for (i) specifying the plurality of partial defect lists included in the defect management information recorded in said defect management area on said write-once-type recording
25 medium, on the basis of the index of the index information, (ii) reading the specified plurality of partial defect lists, (iii) connecting

the read plurality of partial defect lists to thereby form one defect list, and (iv) storing the one defect list into said memory device.

10. A recording apparatus for recording record data onto a
5 write-once-type recording medium comprising: (I) a data area in which the record data is recorded; (II) a spare area in which the record data to be recorded or already recorded at a position of a defect in said data area is recorded; (III) a temporary defect management area in which defect management information
10 including a defect list is temporarily recorded, the defect list indicating (i) the position of the defect in said data area and (ii) a position in said spare area at which the record data to be recorded or already recorded at the position of the defect is recorded; and (IV) a definite defect management area in which the defect management
15 information is definitely recorded, said defect list being divided into a plurality of partial defect lists,

said recording apparatus comprising:

a first recording device for recording the record data into said data area;

20 a memory device for storing therein the defect management information;

a defect-detecting device for detecting a defect in said data area;

a second recording device for recording the record data to be
25 recorded at the position in said data area of the defect detected by said defect-detecting device, into said spare area;

a list-updating device for updating the partial defect list by recording, onto the partial defect list, information for indicating (i) the position of the defect detected by said defect-detecting device and (ii) the position in said spare area at which the record data to
5 be recorded at the position of the defect is recorded; and

a third recording device for (i) selecting the partial defect list updated by said list-updating device from among the plurality of partial defect lists included in the defect management information stored in said memory device and (ii) recording the selected partial
10 defect list into said temporary defect management area.

11. The recording apparatus according to claim 10, further comprising an index information appending device for appending index information able to be an index for specifying a partial defect
15 list among the partial defect lists which carries newest information, to the partial defect list updated by said list-updating device,

said third recording device recording (i) the partial defect list updated by said list-updating device and (ii) the index information, into said temporary defect management area.

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12. The recording apparatus according to claim 11, further comprising a reading device for (i) specifying the plurality of partial defect lists included in the defect management information recorded in said temporary defect management area on said write-once-type
25 recording medium, on the basis of the index of the index information, (ii) reading the specified plurality of partial defect lists, (iii)

connecting the read plurality of partial defect lists to thereby form one defect list, and (iv) storing the one defect list into said memory device.

5 13. The recording apparatus according to claim 12, further comprising a fourth recording device for recording the one defect list stored in said memory device, into the definite defect management area.

10 14. The recording apparatus according to claim 13, further comprising a finalize-command device for giving a finalize-command for indicating to finalize said write-once-type recording medium,
said fourth recording device recording the one defect list into
the definite defect management area in response to the
15 finalize-command.

15. A computer program of instructions for tangibly embodying a program of instructions executable by a computer to make the computer function as a recording apparatus according to claim 7.
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16. A computer program of instructions for tangibly embodying a program of instructions executable by a computer to make the computer function as a recording apparatus according to claim 10.

25 17. A recording method of recording record data on a write-once-type recording medium comprising: (I) a data area in

which the record data is recorded; (II) a spare area in which the record data to be recorded or already recorded at a position of a defect in said data area is recorded; and (III) a defect management area in which defect management information including a defect list is recorded, the defect list indicating (i) the position of the defect in said data area and (ii) a position in said spare area at which the record data to be recorded or already recorded at the position of the defect is recorded, said defect list being divided into a plurality of partial defect lists,

10 said recording method comprising:

 a memory process of storing the defect management information;

 a first recording process of recording the record data into said data area;

15 a defect-detecting process of detecting a defect in said data area;

 a second recording process of recording the record data to be recorded at the position in said data area of the defect detected by said defect-detecting process, into said spare area;

20 a list-updating process of updating the partial defect list by recording, onto the partial defect list, information for indicating (i) the position of the defect detected by said defect-detecting process and (ii) the position in said spare area at which the record data to be recorded at the position of the defect is recorded; and

25 a third recording process of (i) selecting the partial defect list updated by said list-updating process from among the plurality of

partial defect lists included in the defect management information stored in said memory process and (ii) recording the selected partial defect list into said defect management area.